PROGRESS REPORTS

FROM

EXPERIMENT STATIONS

SEASON 1957-58

REPUBLIC OF THE SUDAN

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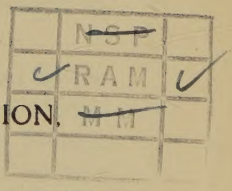

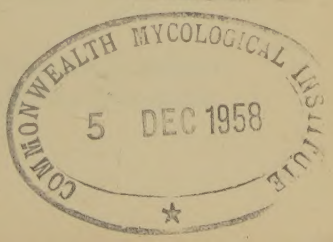

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REPUBLIC OF THE SUDAN
COTTON BREEDING STATIONS
PROGRESS REPORT FOR THE SEASON 1957-58

	Planting Dates.	*Picking Dates.*
Gezira	Mid August to mid September	January to March.
Gash	Late August to late September.	Mid January to April.
Tokar	Early September to mid October.	January to May.
Kordofan	Mid June to mid August.	Mid October to February.
Zeidab	First half May.	September to December.
Equatoria	Mid May to August.	October to mid February.

Introductory Note

BY

M. F. ROSE.

Staff.

After 30 years' service with the Cotton Breeding Section Sayed Ahmed Abdel Rahman retired from Government employ on 20th October 1957. As Inspector, Cotton Propagation, he was replaced by Mahmoud Eff. Abdel Nabi transferred from Shambat to Wad Medani on 26th August 1957.

Mr. R. C. Faulkner, Cotton Breeder, was transferred from the Cotton Research Station, Namulonge, arriving at Wad Medani on 3rd May 1958. He will supplement the Corporation's staff in the Sudan, following the temporary transfer of Mr. L. C. Hughes to Namulonge. Mr. Hughes will return to the Sudan in August 1960.

Visitors.

Mr. J. C. May visited the Sudan from 30th December 1957 to 8th January 1958. Contacts were renewed with the Department of Agriculture, Khartoum, and the Sudan Gezira Board, while problems of administration and staff were discussed at Shambat and Wad Medani.

As a member of the Sudan Scientific Advisory Committee, Sir Joseph Hutchinson attended the Conference held in Khartoum from 11th-13th January. Prior to this, he visited both Shambat and Wad Medani where detailed discussions were held on all lines of work pursued by the Cotton Breeding Section.

On 30th November a fleeting trip was made to Wad Medani by Dr. T. R. Richmond, Professor of Agronomy, Texas Agricultural Experiment Station, and Mr. H. C. Porter, Cotton Division, Foreign Agricultural Service, Washington. Although very brief, the contact was fully appreciated.

Mr. C. Logan, of the Plant Pathology Section, Namulonge, visited the Sudan in early October and again from 11th-17th December.

Blackarm and the wilt problem both in Aden and the Sudan were the chief subjects of discussion.

Tours.

During the absence of Dr. A. D. Hanna from the Sudan, Mr. M. F. Rose, Acting Chief of the Agricultural Research Division, attended the Namulonge Conference held in early December: his visit to Uganda extended from 3rd-12th December.

From 25th October to 5th November Mr. A. Low visited Kordofan. With headquarters at Kadugli, he inspected the work in progress at the Kamina farm and reported on various aspects of the commercial crop.

THE GEZIRA RESEARCH STATION

BY

M. F. ROSE, L. C. HUGHES AND A. LOW.

Survey of the Season.

From the point of view of field experimentation and large and small scale propagation, the 1957-58 season must be regarded as a failure. The Sakel area of 51·5 feddans averaged 1·28 large kantars (385 lb. of seed cotton per acre) and that under X1730A (130·75 feddans) 2·52 (757 lb./acre), while the overall mean (including mixed cotton) was 2·03 (610 lb./acre). This overall mean compares most unfavourably with that of the very bad season 1951-52 when the Station averaged 2·50 large kantars of seed cotton (751 lb. per acre) and does not bear comparison with yields from the past season when average returns were 7·73 large kantars (2,323 lb. per acre).

The sequence of events leading up to these disastrous returns is worthy of comment and the meteorological table (given below) throws some light on two seasons of extreme contrast. It should be noted that the previous season's rainfall, 442·0 mm., was relatively heavy, so that in terms of the 'rainfall equation' the present season started with a negative sign for future computations of yield. Although the 1st July-15th August rainfall (244·5 mm.) was above the accepted mean of 218, this figure was only attained by a precipitation of 52·2 mm. on 14th August 1957. With this delayed, two minus quantities (the worst possible combination) would have appeared in the regression equation: the distribution within this period was also very variable. September rainfall (32·2 mm.) was well below average (59 mm.) and of this 24·5 mm. fell in the first week of September. During the

growing period temperatures were higher and humidities lower than during the 1956-57 season. Although a relatively cold spell was experienced from 6th January 1958, with temperatures down to 45°F., it is unlikely that this had any effect on final yield figures for the damage had already been done. However, ground cover of the crop throughout its history was very poor and it is reasonable to assume that extremes of both heat and cold within the crop were accentuated by the absence of this modifying influence.

Owing to rain in mid August, there was an extension of the planting period from 13th to 25th August. Germination and establishment were good. From 12th September, however, growth appeared halted and from this date until the end of the year pests and disease made inroads into the crop. Flea beetle appeared on 20th August, while by the end of September whitefly populations had increased to epidemic proportions. By mid October, thrips damage was very marked and jassid numbers had shown a remarkable increase. An unknown 'wilt' disease, first appearing in the American breeding plot on the N.E. Extension on 23rd October, devastated the crop (2 acres) within ten days. 'Wilt' also appeared on the main farm in early November and much damage was done to the breeding plots H28 and H29. As was expected, leafcurl appeared in early November and ran through all Sakel and Sakel derivatives: toward the end of the season the L types showed a measure of infection which bears witness to the severity of the whitefly attack.

METEOROLOGICAL READINGS, G.R.S., 1957-58.

Date	*Mean max.* °F.	*Mean Min.* °F.	*Total Rainfall* mm.	*Average R.H.* 8 a.m.
April '57	104 (105)	65 (69)	— (—)	14 (16)
May	101 (107)	75 (74)	4·5 (2·4)	36 (25)
June	104 (101)	79 (75)	11·6 (36·1)	51 (51)
July	98 (92)	74 (71)	113·1 (120·9)	68 (76)
August	92 (89)	72 (70)	160·6 (159·7)	79 (83)
September	98 (92)	72 (70)	32·2 (103·6)	70 (79)
October	102 (97)	73 (69)	2·6 (18·5)	49 (59)
November	100 (99)	72 (66)	0·3 (—)	42 (47)
December	106 (92)	62 (58)	— (—)	43 (41)
January '58	93 (89)	58 (54)	— (—)	42 (35)
February	93 (90)	56 (54)	— (—)	32 (32)
March	104 (99)	64 (67)	— (0·8)	22 (25)
			324·9 (442·0)	

Figures in brackets are returns for the 1956-57 season.

Flowering was very poor and there was continuous shedding of both natural and selfed material from mid November. All Sakel and Sakel types on the farm had finished by mid January and the final pick of all types on the Standard Variety Trial G.R.S. was on 6th February. Mean boll weights were about 1·8 gm. with those from the

earlier picks ranging from 1·3-1·8 gm. This mean figure compares with 3·1 gm. in the 1956-57 season. Ginning outturns were remarkably low for all types, with Sakel and X1730A standing at 26% and 29% respectively.

Apart from the absence of blackarm, every circumstance militated against healthy growth and ultimate yield. Needless to say all experiments will have to be repeated in the coming season.

Breeding (Egyptian)

In view of the fact that the season produced cotton sticks rather than cotton plants, return of seed was extremely poor and in many cases selfed seed was not recovered at all. It thus became a question of salvaging what seed there was, and in consequence selfed plants within progeny rows were bulked in order to give adequate planting seed for the coming season.

(1) B_2 B_3 S × L Material.

In the B_2B_3 Sakel × B_2B_3 L material (fully detailed in the 1956-57 Progress Report, page 5) individual selfed plants of the phenotype F_2 (1st b/c) were bulked to give 14 special bulks for future planting. The same procedure of bulking selfed plants within progeny rows was adopted for the F_3 plants stemming from the straight F_2 of the original cross, giving 260 lots for the carry-over. With G.O.T.s for the replicated controls X1730A and BAR 14/25 standing at 29·0% and 25·8% respectively and with very small quantities of inferior seed cotton returned, it was considered that any form of detailed analysis on this material was futile.

(2) Pima S1 × BAR 14/25.

25 lots of F_1 seed from this cross were planted on 14th September. This planting date was late, but since the seed had been produced at Shambat as an out-of-season crop such a delay was unavoidable. Growth and appearance of the F_1 plants were extremely poor and seed was recovered from only 13 out of the 25 lots. Owing to the very poor return of selfed seed, the F_2's in each progeny row were bulked and will be carried forward as 13 small special bulks in the coming season.

Breeding and Testing (Egyptian)

When new material, produced either at Shambat or Wad Medani, is tested in replicated trials one block is ear-marked for selfing, and yield

figures from this are excluded from the general analysis. Thus selfed seed of all strains or sub-strains is carried forward each year as small special bulks pending the accumulation of spinning test data and yield figures. These bulks act as reservoirs for future single plant selection and progeny row work. For this reason, data from small scale trials are listed under 'Breeding and Testing' rather than under 'Testing' alone.

(*a*) *Blackarm Resistant Sakels and X1730A Types.*

The importance of B_6 in the blackarm resistance make-up was emphasized in the 1956-57 Report and further evidence of the necessity of its transfer to commercial varieties has been presented in the Shambat Report of the present season. If a new form of blackarm has arisen (and this probability has been accepted by Shambat) then it is merely a question of time before it invades the whole Gezira and becomes established there. For this reason every effort is being made to integrate B_6 into the present B_2 B_3 genotype at the same time synthesizing a parallel series of B_2 B_6 material.

The present season was most inauspicious for the first introduction of BAR 14/48 ($B_2B_3B_6$ Sakel), BAR 14/38 (B_2B_6 Sakel) and BAR 4/23 (B_2 B_6 X1730A) to the Medani Station. Yields were hopelessly down and the quality of the seed cotton did not warrant detailed laboratory analysis. For these reasons final yield figures are not given.

The B_2 B_3 B_6 L series, grown at Wad Medani for the first time in 1956-57, was also disappointing although the pattern of yield returns fell roughly in line with that of the previous season. A measure of variability (in the right direction) appears to exist in the figures given below.

B_2 B_3 B_6 X1730A SERIES.

Strain		*Genotype*	*S/c. lb./acre*	*Lint lb./acre*	*G.O.T.*
BAR 4/25	A	B_2 B_3 B_6 (L)	227	57	25·0
	B	,,	168	41	24·6
	C	,,	272	75	27·5
	D	,,	245	66	26·8
	E	,,	249	63	25·3
	F	,,	187	48	25·4
	G	,,	214	56	26·4
BAR 5/7	A	,,	150	35	23·5
	C	,,	149	37	25·0
	D	,,	173	42	24·1
	E	,,	240	60	25·0
XA (Control)		b_2 b_3 b_6 (L)	224	63	28·0
S.E. (Mean)				6·5	
L.S.D. (5% level)				19	

Planted 24th August. 4 replications. 3 row plots.

(*b*) *BLR 14/16 (B_2 B_3 Sakel Types Carrying Leafcurl Resistance).*

Figures from the replicated trial shown below are of particular interest in this season of severe leafcurl attack. The measure of resistance carried by BLR 14/16 and its sub-strains has been demonstrated at Shambat, and if whitefly populations continue to increase and there is with them a corresponding increase of leafcurl in the commercial crop, then every effort must be made to exploit the yield variability within this type, at the same time building up a further resistance to the virus. Past records show that under normal conditions seed cotton yields of BLR 14/16 are consistently lower than those of Sakel or Sakel derivatives and with a lower G.O.T. the gap is still further widened in lint returns. This gap must be bridged if BLR 14/16 is to compete successfully with present commercial varieties. Although there is no significant difference between BAR 14/25 and BLR 14/16, yield figures from BA 389 and BA 415 are worthy of note.

Strain	*Genotype*	*S./c. lb./acre*	*Lint lb./acre*	*G.O.T.*
Average of II BA strains	B_2 B_3 (S)	199	52	25·7
Best of 11 BA strains				
BA 415	,,	223	61	27·4
BA 389	,,	233	62	26·8
BLR 14/16 (C)	B_2 (S)	231	56	24·1
BAR 14/25 BK	B_2 B_3 (S)	168	40	23·7
S.E. (Mean)			7·6	
L.S.D. (5% level)			22	

Planted 22nd August. Small scale variety trial. 4 replications. 1 row plots.

Average of 5 BA strains	B_2 B_3 (S)	198	52	25·8
BLR 14/16 (C)	B_2 (S)	220	50	22·5
BAR 14/25	B_2 B_3 (S)	222	56	25·0
S.E. (Mean)			5·25	
L.S.D. (5% level)			N.S.	

Planted 22nd August. Very small scale variety trial. 3 replications. 1 row plots.

(*c*) *Blackarm Resistant Karnak (B_2B_3). F_3 Generation.*

This is the first occasion on which Karnak and Karnak derivatives have appeared in direct comparison with a Sudan Sakel type. Under the conditions of this very bad season it will be noted that Karnak bulk has significantly outyielded BAR 14/25 in lint per acre.

There is a wide range between the Karnak derivatives but only two, BA 554 and BA 556, have approached the yield level of the parental bulk.

Strain	*Genotype*	*S./c. lb./acre*	*Lint lb./acre*	*G.O.T.*
Average of 21 Karnak derivatives	B_2 B_3	163	46	27·8
Best of 21 Karnak derivatives				
BA 554	,,	239	68	28·5
BA 556	,,	259	70	27·0
Karnak BK	b_2 b_3	240	73	30·3
BAR 14/25	B_2 B_3 (S)	182	49	26·9
S.E. (Mean)			6·4	
L.S.D. (5% level)			18	

Planted 22nd August. Small scale variety trial. 6 replications. 1 row plots.

TESTING.

(1) To obtain more data on the yield response and spinning performance of BLR 14/16, a trial of 11 replications of BAR 14/25 and BLR 14/16 was planted on August 22nd. Yields of both types were remarkably low and comparisons offer little information.

BAR 14/25	163 s/c lb./acre	42 lint lb./acre	G.O.T.	25·5
BLR 14/16	178 ,, ,, ,,	44 ,, ,, ,,	,,	24·5

(2) On the same day the *thurberi* derivatives, J2060 and J2061, were planted in a replicated (6) trial with BAR 14/25 as control. Yield data, with significance in favour of BAR 14/25, are given below:

J2060	115 s/c lb./acre	31 lint lb./acre	G.O.T.	26·6
J2061	106 ,, ,, ,,	27 ,, ,, ,,	,,	25·6
BAR 14/25	157 ,, ,, ,,	39 ,, ,, ,,	,,	25·0

(3) Seven replications of BAR 14/25.5 Group I, II, III with BAR 14/25 bulk as the control were also sown on 22nd August. Yields were of a very low order and no significant differences were obtained.

(4) The six lots of Montserrat Sea Island cotton kindly supplied by the Cotton Officer, Antigua, British West Indies, were planted in 2 observation blocks with BAR 14/25 as control. Germination and establishment were good but like all other types they succumbed to the impact of the very bad season. One point of interest arises from observations made—all types appeared more resistant to leafcurl than BAR 14/25.

	S/c. lb. acre	*Lint lb. acre*	*G.O.T.*
Range of 6 MSI.	159 to 203	43 to 53	25·4 to 28·8
BAR 14/25	198	53	26·8

Lint assessment by the Chief Cotton Classifier gave all types better than BAR 14/25: they were finer and approximately $\frac{1}{8}$" longer.

(5) Data and comments on the BAJ and BAN trials conducted at Wad Medani are given in the Shambat section of the Report.

(6) Tanguis Crosses.—Strains derived from the original Tanguis × BAR 14/25 cross were grown in 2 trials of 4 replications each. The history of the material in the two separate experiments was as follows: Trial I. 13 strains. T36 – T45 (Tanguis × BAR 14/25) × BAR 14/25 F_3. T46 – T48 (Tanguis × BAR 14/25) × (BAR 14/25)^2 F_2. Trial II. 35 strains. T1 – T35: all straight F_4's from the original cross.

Under the conditions of the present season, Tanguis in the breeding plots seemed stronger and more robust than any other *barbadense* type. However, in common with all other selections the G.O.T.s were markedly reduced. The trials produced an interesting range of material in both yield and quality: only one strain, T26, gave true Tanguis lint but it should be pointed out that Tanguis itself grown under Sudan irrigated conditions has not the true characteristics of the Peruvian growths. In terms of lint produced, both trials showed significant differences. To save extensive tabulation, the results have been abbreviated.

	Type	*Lint lb./acre Range*	*G.O.T. Range*
Trial I	T36 – T48	97 – 31	30·5 – 26·0
	Tanguis (C)	80	32·4
	BAR 14/25	54	26·2
Trial II	T1 – T35	126 – 36	33·7 – 26·4
	Tanguis (C)	59	31·5
	BAR 14/25	50	26·4

A parallel series of forty-eight small special bulks (selfed material) was carried forward.

Breeding and Testing (American)

(1) On 25th August 3 factorial experiments were planted on the North-Eastern Extension of the Station. These comprised F_3 material originating from the cross (i) BAR 11/7 × Hopi Acala (ii) BAR 7/8.2 × Hopi Acala (ex Kadugli) and (iii) BAR 7/8.2 × Hopi Acala (ex Shambat). The object of this work has been discussed in previous Reports, namely the transfer of intrinsic fibre strength from Hopi Acala to the commercial Kordofan varieties. In late October the 3 trials which had shown excellent promise were devastated by wilt attack and in many cases seed cotton was picked from plants in various stages of wilting. What measure of reliability can be attached to the results is debatable but it would appear from a careful analysis, block by

block, that Hopi Acala has in fact boosted yields well above the controls. In all three trials a high level of significance (1%) was obtained.

Relevant data for comparison are given below—

TRANSFER OF INTRINSIC FIBRE STRENGTH FROM H.A. AND YIELD INCREASE.

A

BAR 7/8.2 × Hopi Acala (ex Kadugli)	F_2	F_3				
	Stelometer	G.O.T.	L.I.	Seed wt.	Yield lb. lint per acre	Yield lint as % BAR 7/8.2
Mean of 9 selected families	M: 24·7 R: 23·2-28·0	32·6 30·7-35·7	3·7 3·5-4·1	7·7 6·3-9·0	196 190-231	187% —
Mean of 15 families in trial 1957-58	M: 24·4 R: 23·2-28·0	32·4 30·7-35·7	3·6 3·1-4·1	7·4 6·3-9·0	185 96-231	176% —
BAR 7/8.1 (C)	21·0	32·2	2·5	5·0	66	63%
BAR 7/8.2 (C)	19·1	34·4	2·8	5·3	105	100%
Hopi Acala (C)	24·0	31·0	3·6	8·0	86	82%

B

BAR 7/8.2 × Hopi Acala (ex Shambat)	F_2	F_3				
	Stelometer	G.O.T.	L.I.	Seed wt.	Yield lb. lint per acre	Yield lint as % BAR 7/8.2
Mean of 11 selected families	M: 24·6 R: 23·1-26·4	34·5 32·2-36·0	4·0 3·8-4·4	6·9 7·0-8·0	146 108-165	149% —
Mean of 22 families in trial 1957-58	M: 24·4 R: 22·5-26·9	34·5 32·2-38·8	3·8 3·1-4·4	7·2 5·0-8·3	137 104-165	140% —
BAR 7/8.1 (C)	21·0	36·0	2·9	5·2	71	75%
BAR 7/8.2 (C)	19·1	35·9	3·3	6·0	98	100%
Hopi Acala (C)	24·0	32·3	4·0	8·4	88	90%

C

BAR 11/7 × Hopi Acala	F_2	F_3				
	Stelometer	G.O.T.	L.I.	Seed wt.	Yield lb. lint per acre	Yield lint as % BAR 7/8
Mean of 9 selected families	M: 25·8 R: 23·4-27·3	32·2 29·6-34·3	3·2 2·8-3·8	7·0 6·0-8·2	124 99-138	132% —
Mean of 15 families in trial 1957-58	M: 25·2 R: 23·3-27·9	32·3 29·4-34·3	3·3 2·8-3·9	7·0 6·0-8·2	120 99-138	128% —
BAR 11/7 (C)	21·0	30·4	2·6	5·9	94	100%
BAR 7/8.2 (C)	19·1	34·9	2·9	5·5	91	97%
Hopi Acala (C)	24·0	32·1	3·8	7·9	81	86%

R = Range M = Mean (C) = Control

Note: The above tables demonstrate that selection for quality has not been at the expense of yield.

(2) Fifteen F_3 families, each containing 20 plants and originating from the original cross BAR 11/7 × Wilds SUS 16/1, were subjected to detailed analysis. The main objectives in this work are (i) the transfer of boll weight from Wilds to BAR 11/7 in an endeavour to boost yield while retaining the lint characteristics of BAR 11/7; (ii) the transfer of 'wilt' resistance from Wilds to BAR 11/7 (if early American types are to be grown in the Gezira this transfer is one of major economic importance); (iii) the transfer of *Ramularia* resistance to the American type (see Kadugli Report). Analyses of this F_3 material have also indicated that types are available combining the boll weight and lint length of Wilds with the framework of BAR 11/7. Here the work will bifurcate and attempts will be made to eliminate proneness to lodging from the Wilds make-up.

(3) A small special bulk of F_1 plants from the cross BAR 11/7 × BAR 7/8.2 was also grown. 32 single plants from BAR 11/7 × BAR 7/8.2 and 42 from the reciprocal cross will be planted in the coming season. The main object in this line of work is to combine in one single type the quality of BAR 11/7 and the yield of BAR 7/8.2.

Standard Variety Trials.

The standard trials were planted at Turabi (North), Gezira Research Station (Centre) and Hag Abdulla (South) on 12th-13th, 13th and 18th August respectively. There were 20 replications at each site with effective plot size 0·0133, 0·0107, 0·0107 acres. Spacing was standard at 80 cm. × 35 cm. with 3 plants per hill at final thinning.

Germination and establishment on all trials were good, to be followed by the unhappy sequence of events which struck the main Gezira crop.

Lint returns from the Gezira Research Station were the lowest on record, in part due to a devastating wilt attack; except at Turabi, all G.O.T.s were remarkably low and lint quality very poor. Generally all L types were superior in yield to Sakel and Sakel derivatives, a response doubtless due to differences in robustness of plant type and resistance to disease. It should be noted that all S types were much more susceptible to 'wilt' than their L counterparts, although the latter were not precluded from attack. Significant differences are noted between the filters of BAR 14/25.4 and 5. Similar differences in favour of 4 have been recorded in small scale trials. Both at G.R.S. and Hag Abdulla the position of BAR 4/24 ($B_2B_3B_6$ L type) is disappointingly low.

Table 1 gives the yield from these trials. They offer little information and are included for record purposes only. A summary of performance of current strains in the standard trials is given in Tables 2 and 3.

Table 1.

Gezira Variety Trials, 1957-58.

Yield of Seed Cotton and Lint in lb./acre.

Variety	BAR Genes	Turabi (North)			G.R.S. (Centre)			Hag Abdulla (South)			Overall Means		
		Seed Cotton	Lint	G.O.T.	Seed Cotton	Lint	G.O.T.	Seed Cotton	Lint	G.O.T.	Seed Cotton	Lint	G.O.T.
Domains Sakel	—	582	184	31·6	295	77	26·1	1011	277	27·4	629	179	28·5
BAR 14/25	B_2B_3	594	181	30·5	283	76	26·9	993	267	26·9	623	174	27·9
BAR 14/25.4 Bk.	,,	582	178	30·6	270	71	26·3	948	257	27·1	600	168	28·0
,, ,, ,, Group 1	,,	571	184	32·2	—	—	—	—	—	—	571	184	32·2
,, ,, ,, ,, 2	,,	602	189	31·4	—	—	—	—	—	—	602	189	31·4
,, ,, ,, ,, 3	,,	575	181	31·5	—	—	—	—	—	—	575	181	31·5
BAR 14/25.5 Group 1	,,	539	168	31·2	—	—	—	—	—	—	539	168	31·2
,, ,, ,, ,, 2	,,	540	168	31·1	—	—	—	—	—	—	540	168	31·1
,, ,, ,, ,, 3	,,	555	171	30·8	—	—	—	—	—	—	555	171	30·8
BLR 14/16	B_2	557	163	29·3	—	—	—	—	—	—	557	163	29·3
X1730A	—	903	311	34·4	503	147	29·2	1330	417	31·4	912	291	31·9
BAR XL1	B_2	—	—	—	495	144	29·1	1240	393	31·7	867	268	30·9
BAR 4/24	$B_2B_3B_6$	—	–	—	370	96	25·9	937	261	27·9	653	178	27·3
BAR 4/16	B_2B_3	—	—	—	491	138	28·1	1086	328	30·2	788	233	29·6
BAR 4/16 Group 1	,,	—	—	—	513	147	28·7	1180	361	30·6	846	254	30·0
,, ,, ,, 2	,,	—	—	—	515	146	28·3	1278	388	30·4	896	267	29·8
,, ,, ,, 3	,,	—	—	—	506	145	28·7	1216	366	30·1	861	255	29·6
BAR 5/6 Group 1	,,	—	—	—	482	138	28·6	1294	390	30·1	888	264	29·7
,, ,, ,, 2	,,	—	—	—	442	123	27·8	1330	399	30·0	886	261	29·5
,, ,, ,, 3	,,	—	—	—	473	135	28·5	1200	364	30·3	836	249	29·8
Standard Error (Mean)			4·3			4·9			13·5				
Sign. Diff. (P=0·05)			12			13			38				

Table 2.

Summary of Performance of Current Strains in Gezira Variety Trials up to and including Season 1957-58.

Variety	Basic Type	Seed Cotton (lb./acre)					Lint (lb./acre)					Location
		No. of Trials	Mean			Variety as % of	No. of Trials	Mean			Variety as % of	
			Variety	X1730A	Dom. Sakel	X1730A / Dom. Sakel		Variety	X1730A	Dom. Sakel	X1730A / Dom. Sakel	
Dom. Sakel	—	19	1263	1302	1263	97 / 100	19	405	466	405	87 / 100	Northern Gezira
BAR 14/25	B_2B_3	8	1441	1494	1432	96 / 101	8	450	533	465	84 / 97	
BAR 14/25.4	,,	2	1166	1397	1150	83 / 101	2	345	479	359	72 / 96	
,, ,, ,, Group 1	,,	1	571	903	582	63 / 98	1	184	311	184	59 / 100	
,, ,, ,, ,, 2	,,	1	602	903	582	67 / 103	1	189	311	184	61 / 103	
,, ,, ,, ,, 3	,,	1	575	903	582	64 / 99	1	181	311	184	58 / 98	
BAR 14/25.5 Group 1	,,	1	539	903	582	60 / 93	1	168	311	184	54 / 91	
,, ,, ,, ,, 2	,,	1	540	903	582	60 / 93	1	168	311	184	54 / 91	
,, ,, ,, ,, 3	,,	1	555	903	582	61 / 95	1	171	311	184	55 / 93	
X1730A	—	19	1302	1302	1263	100 / 103	19	466	466	405	100 / 115	
X1730L-1	B_2	14	1368	1389	1421	98 / 96	14	486	507	450	96 / 108	
BLR 14/16	B_2	1	557	903	582	62 / 96	1	163	311	184	52 / 89	
Dom. Sakel	—	32	1476	1734	1476	85 / 100	32	468	611	468	77 / 100	Central Gezira
BAR 14/25	B_2B_3	8	1486	1539	1330	97 / 112	8	468	550	430	85 / 109	
BAR 14/25.4	,,	2	1468	1589	1391	92 / 106	2	456	551	434	83 / 105	
X1730A	—	32	1734	1734	1476	100 / 117	32	611	611	468	100 / 131	
X1730L-1	B_2	16	1625	1537	1288	106 / 126	16	575	550	414	105 / 139	
BAR 4/16	B_2B_3	7	1688	1565	1251	108 / 135	7	574	564	411	102 / 140	
,, ,, Group 1	,,	2	1609	1589	1391	101 / 116	2	533	551	434	97 / 123	
,, ,, ,, 2	,,	2	1605	1589	1391	101 / 115	2	531	551	434	96 / 122	
,, ,, ,, 3	,,	2	1539	1589	1391	97 / 111	2	509	551	434	92 / 117	
BAR 5/6	,,	1	2548	2674	2487	95 / 102	1	853	955	791	89 / 108	
,, ,, Group 1	,,	2	1578	1589	1391	99 / 113	2	521	551	434	95 / 120	
,, ,, ,, 2	,,	2	1533	1589	1391	96 / 110	2	505	551	434	92 / 116	
,, ,, ,, 3	,,	2	1536	1589	1391	97 / 110	2	507	551	434	92 / 117	
BAR 4/24	$B_2B_3B_5$	1	370	503	295	74 / 125	1	96	147	77	65 / 125	
Dom. Sakel	—	15	1414	1579	1414	90 / 100	15	448	556	448	81 / 100	Southern Gezira
BAR 14/25	B_2B_3	8	1473	1556	1363	95 / 108	8	447	542	426	82 / 105	
BAR 14/25.4	,,	2	1981	1986	1830	100 / 108	2	600	680	561	88 / 107	
X1730A	—	15	1579	1579	1414	100 / 112	15	556	556	448	100 / 124	
X1730L-1	B_2	15	1519	1429	1223	106 / 124	15	533	500	389	107 / 137	
BAR 4/16	B_2B_3	6	1522	1512	1399	101 / 109	6	497	529	448	94 / 111	
,, ,, Group 1	,,	2	1921	1989	1826	97 / 105	2	629	680	561	93 / 112	
,, ,, ,, 2	,,	2	1918	1989	1826	96 / 105	2	627	680	561	92 / 112	
,, ,, ,, 3	,,	2	1927	1989	1826	97 / 106	2	627	680	561	92 / 112	
BAR 5/6	,,	1	2522	2648	2641	95 / 95	1	845	943	845	90 / 100	
,, ,, Group 1	,,	2	1922	1989	1826	97 / 105	2	626	680	561	92 / 112	
,, ,, ,, 2	,,	2	1910	1989	1826	96 / 105	2	616	680	561	91 / 110	
,, ,, ,, 3	,,	2	1764	1989	1826	89 / 97	2	570	680	561	84 / 102	
BAR 4/24	$B_2B_3B_5$	1	937	1330	1011	70 / 93	1	261	417	277	63 / 94	

N.B This table should be read across rows and *not* down the columns

TABLE 3.

SUMMARY OF SPINNING TEST REPORTS ON

CURRENT STRAINS IN THE GEZIRA VARIETY TESTS, 1942-43 TO 1956-57.

Variety	*Type*	*Effective Length 32's*			*Standard Fibre Weight*			*Corrected Lea-Strength Products*					
		No. of Trials	*Means*		*No. of Trials*	*Means*		*No. of Trials*	*Means of 80's Counts*		*No. of Trials*	*Means of 100's Counts*	
			Variety	*DS*		*Variety*	*DS*		*Variety*	*DS*		*Variety*	*DS*
BAR 14/25	B_2 B_3	18	47·9	45·8	18	147	149	18	2502	2492	18	2223	2195
BAR 14/25.4	B_2 B_3	3	45·3	44·0	3	146	151	3	2389	2336	3	2161	2103
BLR 14/16	B_2	4	49·2	46·8	4	141	148	4	2617	2571	4	2377	2236
			Variety	XA		*Variety*	XA		*Variety*	XA		*Variety*	XA
BAR XL1	B_2	32	46·6	46·1	32	163	163	40	2068	2065	31	1802	1814
BAR 4/16	B_2 B_3	3	44·0	46·0	3	168	168	3	1943	2051	3	1630	1661
,, ,, Group 1	,,	2	46·0	46·0	2	170	164	2	1906	2012	2	1596	1619
,, ,, ,, 2	,,	2	46·5	46·0	2	170	164	2	1929	2012	2	1613	1619
,, ,, ,, 3	,,	2	47·0	46·0	2	170	164	2	1983	2012	2	1682	1619
BAR 5/6	,,	3	46·3	46·0	3	173	168	3	1998	2051	3	1667	1661
,, ,, ,, 1	,,	2	46·5	46·0	2	173	164	2	1916	2012	2	1598	1619
,, ,, ,, 2	,,	2	46·0	46·0	2	175	164	2	1985	2012	2	1623	1619
,, ,, ,, 3	,,	2	46·0	46·0	2	173	164	2	1930	2012	2	1587	1619

The Aliab Variety Trial (sited in Northern Province) was planted on 12th May. There were 14 replications with effective plot size 0·018 acres. Picking dates were from 22nd August to 8th October. Yield data are presented below:—

Variety	*S/c lb./acre*	*Lint lb./acre*	*G.O.T.*
Coker 100 Wilt	1707	608	35·6
Wilds SUS 16/1	1375	434	31·5
Coker Wilds 11	1281	402	31·2
S.E. Mean		12·3	
L.S.D. (5%)		35	

As was expected, the short staple Coker 100 Wilt gave the highest yield of lint per acre. The relative positions of Wilds SUS 16/1 and Coker Wilds 11 are of interest, for since grade from the former was superior to that of Coker Wilds 11 there seems little reason why the change to Wilds SUS 16/1 for the whole of the Northern Province should not be effected forthwith.

Miscellaneous.

Grade.

(*a*) *Seed Fuzz.*—The increase of seed fuzz in the commercial crop has been apparent over several years and similar trends have been noted in the synthetic blackarm types. At the Barakat Seed Farm the standard practice each year is to reject fuzzed seed from nucleus stock, the amount discarded being in the neighbourhood of 1-2%. In view of grade deterioration, it was considered advisable to check up on the fuzz-quality relationship and to this end a trial of 9 replications was laid down. The material planted was BAR 14/25 truly tufted and BAR 14/25 fully fuzzed. In terms of lint yield there was no significant difference between the two types although grade assessment was slightly in favour of tufted. This latter finding is contrary to that of the 1956-57 season when a slight bias was given to fully fuzzed. Thus the matter still remains inconclusive.

	S/c lb./acre	*Lint*	*G.O.T.*
BAR 14/25 (tufted)	215	57·8	26·8
BAR 14/25 (fully fuzzed)	201	53·5	26·9

(*b*) *'Old' versus 'New' seed. Genetic deterioration*:—An account has been given in the 1956-57 Wad Medani Report of the very poor germination from 'Old' seed which rendered the trial quite meaningless.

In consequence seed from all 7 lots was selfed and with natural seed was carried over to the present season for a repeat trial of 6 replications. The very adverse season doubtless vitiated results but detailed analyses were made, the results from which are given below. Relative grade rating per variety was made for each block, giving a comprehensive picture of the trial as a whole.

SEED CHARACTERISTICS.

	DS 48/49	DS 1.2.3. 48/49	DS 56/57	XA 47/48	XA 48/49	1530 47/48	XA 56/57
Boll wt. (gms)	1·89	1·85	1·83	1·99	2·03	2·08	1·99
G.O.T.	26·3	27·0	25·5	28·8	27·9	27·1	28·0
Seed weight	8·6	8·3	8·3	8·6	8·4	8·9	8·6
Lint index	3·2	3·2	3·0	3·6	3·5	3·5	3·5
Seed no.	15·6	15·5	15·7	15·7	16·3	15·5	15·9
Yield lint lb./acre	52·7	43·8	48·1	79·2	75·6	83·0	74·7
	non-significant			non-significant			

GRADE RATING BY BLOCKS. SEED COTTON.

Block 1	1	3	2	2	1		1
2	1	2	3	2	3		1
3	2	1	3	1	3		2
4	1	1	3	1	1		3
5	1	2	2	1	3		1

It should be noted at the outset that, owing to the very small amount and inferior quality of seed cotton, absolute grade assessment was not made. The graders were prepared to say that as far as the three Sakel types were concerned, half a grade would cover the range.

On relative merit, DS 48/49 has a better grade (seed cotton) than DS 56/57 in each of the 5 replications, with DS 1.2.3. (Evelyn's Selected Sakel) holding an intermediate position. Regarding the L comparisons, there is little difference between XA 47/48 and XA 56/57 with XA 48/49 definitely the worst.

Lint assessment on a parallel series of samples produced the following comment. Sakel:—(1) DS 48/49 . . . best for length and strength. (2) DS 1.2.3. 48/49 . . . poor, wasty with staple short and weak. (3) DS 56/57 . . . not so good as DS 48/49 but better than DS 1.2.3. X1730:—all 3 lots practically identical with staple regular and of nice strength. X1530:—a little poorer with more waste (about G5L in grade and staple).

These findings would indicate that Sakel has deteriorated over the last ten years but X1730A has remained fairly stable. The data, however, conflict with spinning test results which show a marked downward trend for X1730A with one much less erratic for Domains Sakel.

SHAMBAT STATION

BY

S. O. S. DARK AND J. H. SAUNDERS.

Meteorology.

Apart from a heavy shower on the last day of May there was no rain until the middle of July. Rain continued with showers in approximately alternate weeks until the middle of September. The total rainfall for the season was 9·5 ins., of which 5·2 ins. fell on 3 days.

The winter was long and comparatively cool. The mean maximum temperature was lowest in January (87°F.) rising suddenly to 108°F. for April with a mean for the year of 98·6°F. The season was very tricky for plant growth, sowing at normal time resulting in almost complete failure, while earlier and later sowings were more successful.

Blackarm.

The in-season grading for blackarm attack confirmed what was found last year out-of-season, that the resistance of B_2B_3 Sakel and Lambert cottons had fallen to grade 8 and these types were indistinguishable from B_2 in their reaction to Shambat inoculum. No experiment could be done with Medani inoculum because of the absence of blackarm this year in the Gezira. B_3 resistance was lower than that of B_2 but no value can be quoted because there was no material available in-season. B_6 resistance, however, is still standing up to every test.

In collaboration with Dr. Last, experiments were grown to investigate aspects of the development of the disease in the presence of resistance factors B_2, B_2B_3, $B_2B_3B_6$, and their absence in susceptible varieties. The Shambat results were inconclusive because of the poor growth which was obtained this year. They showed that under the prevailing conditions the mean grade of the 4 types was the same whether the plants were sprayed at 4 weeks from sowing or at 6 weeks. It was further found that 9 days' delay in grading altered the

susceptible varieties' grade from 12 to 8 while not affecting the grades of those carrying resistance factors. This effect is due to the severely attacked leaves of the susceptible varieties falling off in the interval between gradings, so that newer leaves with lesions not fully developed are graded at the later date. On the resistant varieties the original leaves remain for the second grading.

The systemic phase of the disease, although present, showed very little development this season. A large out-of-season randomized block experiment of 4 replications compared the blackarm grade of 28 combinations of blackarm resistance factors from 3 concentrations of spray of the Shambat inoculum. This will be repeated next in-season together with 2 treatments to compare the Shambat and Medani inocula when prepared from agar cultures. The standard strength of inoculum gave a more virulent grade than inoculum ten times as strong or diluted to one thousandth strength, and the results indicate that a new virulent strain of *Xanthomonas malvacearum* is now present in Shambat. This should be proved next season by using the two cultures under standardized conditions.

Genetics.

A paper on the reaction of the B_2 and B_3 resistance genes is being prepared for the Xth International Genetics Congress in Montreal in August.

Production of Egyptian Varieties Resistant to Blackarm.

To increase blackarm resistance of the commercial types the resistance factors $B_2B_3B_6$ or B_2B_6 are being introduced. Present tests have not demonstrated whether the 3 factor resistance is sufficiently superior to that of the 2 factors to outweigh the increased complication in working with 3 factors.

A second $B_2B_3B_6$ Sakel strain, BAR 14/49, has this year been passed to Medani for testing. It is 7th backcross to Sakel and 3rd backcross to BAR 14/25. Further strains are in preparation. Two strains of B_2B_6 Sakel (BAR 14/40 and BAR 14/41) have also been sent for test at Medani.

Further work is being carried out on a promising but segregating sub-strain of BAR 4/25 ($B_2B_3B_6$ L cotton) and a further strain of B_2B_6 L is in preparation.

Other Transferences of Blackarm Resistance.

The first $B_2B_3B_6$ strain of a Pump Scheme Strain derivative has been sent to Medani for test; this is BAR 11/9.

The transferences of B_2B_3, B_2B_6, $B_2B_3B_6$ to Karnak, Pima S1 and Acala 4-42 are proceeding. The series of transferences of B_2B_6 to BP52 has now been completed. The synthesis of B_2B_6 and $B_2B_3B_6$ strains of the American Upland types derived from PSS and Wilds SUS 16 is continuing. Also b_2B_6 strains of the standard varieties are being synthesized for use in rapid transferences of B_6. For making homology tests, B_1, B_5 and B_7 are being transferred to *hirsutum* stocks.

Investigation is continuing of the blackarm resistance factors transferred from *herbaceum* to Sakel.

Jassid Resistance.

42 families of hairy Sakels (homozygous B_2B_3) selected for hair qualities in 1956-57 were grown for further assessment of hair length and density. A check was also made upon their B_2B_3 status and all were found to be homozygous. A rigorous rejection of all lines not up to standard for hairiness was carried out leaving 18 families with satisfactory length and density of hair. Of the 18, 9 were fully hairy on the lower leaf lamina and stem, 8 were hairy only on the lower leaf lamina and 1 was mixed for these two types.

Since it is known that poor quality often accompanies hairiness in synthetic hairy Sakels (p. 9 Prog. Rep. 1956-57) and that hairiness can also permit the build up of whitefly and aphid populations it was suggested in the course of the year's work that further time spent on this problem may be wasteful in so heavy a programme. In view of this change in policy the 18 lines mentioned above will be stored. However in the current season with exceptionally poor growth in all areas and all trials, certain J lines were better than the control BAR 14/25. The details are given below:—

WAD MEDANI. 1957-58.

	Seed cotton lb./acre	Lint lb./acre	G.O.T.
BAJ 1	211	61	29·0
2	244	63	25·7
3	252	65	25·6
4	327	83	25·5
5	260	68	26·3
6	314	82	26·1
7	280	82	29·3
8	286	75	26·2
BAR 14/25	200	55	27·6
S.E. (Mean)		5·6	
L.S.D. (5% level)		16	

The difference in lint returns per acre between all BAJ lines and the control BAR 14/25 could arise from the protection afforded by hairiness against the severe jassid attack of the present season.

Two J lines which in previous years' variety trials showed promise, having yields comparable with BAR 14/25 and good spinning test figures, have been multiplied and it is hoped to test them on a field scale in the coming season.

Basic studies on the genetics of hairiness continue.

Yield.

The multi-loc strains rejected by Medani on the grounds of lack of germination were put into two 5 × 5 Latin square experiments. The mean plant establishments as percentages of seed sown were:

	In season	Out of season
DS	27	48
BAR 14/25	—	66
N31/57	53	74
N32/57	72	—
N33/57	66	80
N34/57	51	82

From this it would appear that there is no sterility factor operating under Shambat conditions, so that selection against it cannot be practised here.

Test crosses were made (1956-57 Report p. 23) to try to determine whether a major gene NN had been transferred from *hirsutum* to *barbadense*. In conjunction with the weak polygenic system already present it would permit the development of consistently 4 loculed bolls. From the 5th and 6th backcross generations, plants were selected which were expected to be of the Nn and nn genotypes, and these were backcrossed to the dominant *hirsutum* parent T611 which would be NN. The nn plants should then give families all of Nn genotype, and phenotypically should give mean boll-loc values equal to that of the F_1 between T611 and BAR 14/25. The Nn plants on the other hand should produce segregating families with 50% plants phenotypically like the F_1 and 50% with mean boll-loc value halfway between those of T611 and the F_1. The results are tabulated overleaf.

Status	PARENT PLANT		TEST FAMILY RESULTS				
	1956 value for boll-locs	Expected genotype	Family number	Ratio of NN : Nn plants expected	observed	Mean boll-loc values of the grouped plants in the family NN ½way	Nn F_1
6th b.c.	3·5	Nn	N56/57	1:1	20:18	3·976	3·600
„	3·0	nn	N66/57	0:all	0:29		3·676
„	3·5	Nn	N67/57	1:1	7:16	4·281	3·671
5th b.c. F_2	3·1	nn	N68/57	0:all	0:27		3·688
„	3·1	nn	N69/57	0:all	0:22		4·027
6th b.c.	3·0	nn	N70/57	0:all	0:15		3·866
	3·5	Nn	N71/57	1:1	8:6	4·350	3·917
„	3·1	nn	N72/57	0:all	0:11		3·681
„	3·5	Nn	N73/57	1:1	18:14	4·022	3·643

Observed mean boll-loc values for: (NN ½ way is calculated as arithmetic mean of T611 and F_1 values)	NN T611	NN ½ way	Nn F_1	nn BAR 14/25
	4·490	4·024	3·557	3·046

N69/57 seems to be possibly a case of the parent being misclassified as nn when it was actually NN growing under adverse conditions. Similarly N70/57 could be derived from Nn misclassified as nn, which would give a slightly better fit of the ratios to expectation. In the latter case it seems more probable that the high mean boll-loc value is due to the presence of a large number of plus polygenes. Both N70/57 and N71/57 are derived from the same family N69/56, and if the same average correction of −0·332 is made to all their boll-loc values, a very good agreement with expected value is obtained. Further test-crosses have been made to test whether these doubtful families arose from misclassified parents.

In spite of the poor growing conditions this season, many high-ovule lines outyielded Sakel controls. It is known that under unfavourable growing conditions (e.g. out-of-season growth or poor soil) high-ovule lines are often indistinguishable in ovule number from control types. Therefore any differences observed in the past season were worthy of notice. Unfortunately, none of the differences recorded between the strains under test was significant on analysis (coeff. of v. of V.T. 27%). However, the same four strains (BAN 1, 4, 6 and 7 season 56/57) which out-yielded BAR 14/25, in two cases by 10%, were again higher yielding this season. They will be further tested in the coming season and seed from single plant selections from each of these strains will be multiplied for progeny testing in 1959-60.

Seed from panmixed bulks grown out-of-season (November 1957) was planted in a randomized block layout of 10 replications in the past season. The layout was adopted more to be sure of obtaining a proper sample of each strain during ovule number counting than with any idea of analysing the results. 2,800 plants were examined and, out of these, 240 selections were made. 38 of the highest ovule-number selections were crossed to BAR 14/48 ($B_2B_3B_6$), anticipating the need for a highly blackarm resistant high ovule line should increased ovule number prove to be a useful means of increasing yield.

15 bulks go forward to the coming season, the ovule number per loc of the highest being 9·1-9·5 and the least 7·5-7·9, the equivalent figure for BAR 14/25 being 6·1-6·76 (average 6·46). 10 of these bulks will be tested at Wad Medani for yield and quality. 2 of the 10 consist of plants selected for a high percentage of 4-loc bolls in addition to selection for high ovule per loc. Thus strains should be obtainable with increased ovules/loc and locs/boll. The replicated test in which high ovule lines were sown in the past season showed that the 4-loc character was to be found consistently in some lines and was absent from others.

Exploitation of Wild Species and Asiatic Cottons.

G. anomalum and G. triphyllum.—Studies in connection with these two species, as reported in season 1956-57 (p. 24, Rep. 1956-57), continue.

A programme of work to produce synthetic allotetraploids from as many combinations of diploid species as possible has begun. This is being done to facilitate (a) genetic studies between diploid species and New World tetraploids and (b) possible transference of useful factors to commercial cottons.

G. sturtii and G. robinsonii.—A large F_2 family produced from crossing of these "species" has confirmed that they really are distinct species. Further genetical work has been hampered by the extreme sterility which has been encountered.

High Lint Strength Transference from G. thurberi.

From the 4th backcross in this transference, three families (J1353, 1355 and 1360/56) were raised by selfing plants from the top and bottom portions of the curve of distribution of the member plants of the backcross family (J1101/55). In these 3 families, plants were again chosen from the parts of the distribution curves which were thought to correspond to the AA: 2Aa: aa ratio for a postulated major gene transferred from *G. thurberi* which reinforces the polygenic system controlling lint strength.

The spot correlation diagram shows that there is no very strong correlation between the strength value of last year's parent and the mean of the family which it has generated. The following table shows that the 3 groups AA, Aa, aa cannot be differentiated by these tests but only A and a:

Derivatives of	Agreement between parent and family classifications			
	Distinguishing AA, Aa, aa		Distinguishing A, a	
J 1353/56	2/10	20%	8/10	80%
J 1355/56	20/32	62%	28/32	88%
J 1360/56	5/14	36%	9/14	64%

The following table shows the distribution, together with their mean Pressley strengths as per cent. of the control value, of the 27 families which remained in the same genotype group when classified either by their family mean Pressley value or by the value of the generating parent plant.

	AA	Aa	aa
No. of families	4	16	7
Expec. 1:2:1	6·75	13·5	6·75
Parental mean strength 1956	110	104	97
Family mean strength 1957	108	104	100

Bollworm Resistance.

The bollworm resistance transference work has this year had to mark time in a salvage operation. The bad growing conditions happened to hit this experiment with great severity. The in-season sowing produced only dwarfed plants which were attacked by bollworm but produced no useful crop. The remaining seed was used to duplicate the experiment out-of-season. Excellent growth was obtained but seed is now coming in very late and as there was practically no bollworm attack (the susceptible controls were 95% clean) no selection could be made.

Leafcurl.

Attack by leafcurl was widespread on the farm as usual but seemed to be rather less virulent than in previous years.

During the season 1955-56 a new manifestation of leafcurl was observed on some *hirsutum* cottons. It was characterized by the main veins becoming thickened first, as opposed to the classic type in which

thickening first affects the minor veins spreading to the major veins later. Both forms were again observed this season on *barbadense* cotton and a series of transmission experiments has been laid down by Dr. Mohammed Nour of the Faculty of Agriculture to try to elucidate the composition of the virus or viruses responsible for this disease.

From last year's ratooned material from Medani self bred seed has been obtained from 45 individual plants which did not develop leafcurl during 2 years—16 of them having been grafted with leafcurl infected buds.

This year another group of Medani families (1st backcross F_2) was grown. 2,408 plants were grafted with leafcurl infected buds, of which 1,910 were successful "takes". From the latter were selected plants which did not develop leafcurl symptoms and self bred seed of 70 individuals was obtained. Families produced by backcrossing to the resistant parent (L type cotton) averaged 57% plants developing leafcurl symptoms; those to the susceptible parent (S type cotton) had an average of 84% leafcurl plants.

Up to this year *G. sturtii* (one of the wild Australian cotton species with the C genom) has been immune to attack by leafcurl. When grafted upon a leafcurl infected stock last year it never developed symptoms and did not transmit the disease when again grafted to a susceptible stock. In May this year, however, a grafted plant of *G. sturtii* was found with severe major vein symptoms on 3 of its 5 growing points. By the middle of June the newly developed leaves were showing much less severe symptoms as though the plant was growing out of the attack. Since only part of the plant is affected it seems likely that inoculation was by whiteflies rather than through the leafcurl infected stock on which it was growing.

The long term transference of leafcurl resistance from *G. hirsutum* to $B_2B_3B_6$ Sakel and Lambert cottons reported previously (p. 27 Prog. Rep. 1956-57) continues. Four bulks were each panmixed out-of-season 1957 following the 3rd backcross to the *barbadense* parent. These panmixed bulks will be sown in the coming season, rogued to $B_2B_3B_6$ standard after spraying with inoculum, rogued for off-types and rogued throughout the season for leafcurl susceptibles. The remaining plants will be panmixed. The same process will be repeated at the next sowing.

Miscellaneous.

The crosses of type collection *punctatums* to Stoneville doubled haploid were examined for the presence of semi-sterile pollen. Four plants bearing it were found in one strain. However, when Professor Richmond visited here he said that the translocations for which we

were looking could be detected only by looking at the chromosomes. Since we have no suitable microscope the project will have to be continued elsewhere.

Disease and Pests.

A crippling attack by thrips early in the season when the cotton plants were very small set the pace for the season. Hot and cold spells followed at the wrong times so that plants never got a chance to become vigorous.

Whitefly at one time were present in enormous numbers but later disappeared almost entirely. Aphids, jassids and bollworms were less troublesome than usual.

The natural blackarm attack seemed very light this year except in the *G. sturtii* × *G. robinsonii* F_2 which is extremely susceptible and sustained heavy losses amongst the newly planted seedlings.

Leafcurl was prevalent but did not appear to be so crippling as usual. Out-of-season plantings were free from it.

KADUGLI STATION

BY

M. F. ROSE, A. LOW AND HAMDAN EFF. HANNAY.

The Commercial Crop.

The outstanding feature of the 1957-58 season was the very early advent of the rains, with Talodi returning an unprecedented figure of 98·5 mm. for March. A large proportion of a total area estimated at 158,117 feddans was planted in early May and June, and reports indicated excellent establishment and good early growth. Fortunately, the rains were continuous and the usual drought period between the early and main 'Kharif' was not experienced. 81,000 small kantars of seed were issued, an increase of 5,000 over that of the previous season, and hopes were high for a record return of 1 million small kantars of seed cotton. In fact, final purchases totalled only 753,425 small kantars. This sharp fall from the general estimate was ascribed to the early cessation of rain but apart from Dilling, Umm Berembeita and Abbassiya, gauge records at the individual centres do not indicate any

sharp departure from those of a normal season. Picking started as early as mid September and in the Eastern Jebels, especially around Kalogi, pickers were hard to find. In consequence much seed cotton fell to the ground and was lost. In view of the fact that pests and diseases were relatively light, it is difficult to account for an average yield as low as 4·54 small kantars per feddan (approximately 454 lb. per acre).

Blackarm was unimportant. Leaf counts on BAR 7/8.1 prior to leaf shed showed an infection figure of 12% (light) while boll samples taken in January from the commercial crop showed 0·5% boll damage. *Ramularia* attack was again noted on all variety trials and the variety × location response followed the same trend as in the previous season. Thus at Abu Gubeiha BAR 11/7 and Pump Scheme Strain showed the highest susceptibility and Wilds SUS 16/1 the lowest, with the BAR 7/8 derivatives intermediate; at Talodi all varieties were equally infected, whilst at Dilling and Kadugli BAR 7/8 derivatives were the worst infected and Wilds SUS 16/1 the least, with Pump Scheme Strain and BAR 11/7 intermediate. Except at Talodi, where environment may have played a part in reducing all varieties to a common denominator of susceptibility, and not excluding the possibility of a more virulent strain, Wilds SUS 16/1 appears to have a measure of resistance to this mildew.

Of the bollworms, pink bollworm showed the highest incidence (27%) in boll samples taken in mid January. Egyptian bollworm was again present in the crop but the recorded figure was as low as 5·8%. Damage by Sudan bollworm, which has shown a steady increase with the expansion of the commercial crop and was rapidly assuming a position of major importance, was negligible and boll samples (mid January) showed nil infection. With mean temperature and temperature ranges departing little from normal and with an average rainfall, the question arises whether the general shift forward in the rainfall pattern has had some effect, directly or indirectly, in controlling this most serious pest.

Infestation by stainer bugs (*Dysdercus fasciatus* and *superstitiosus*) was slight and the reversion to the old practice of a double campaign against these pests may have accounted for the low degree of staining (0·5%) in January bolls.

The appearance of flea beetle and leaf roller was sporadic, and damage generally was slight save at the new pilot farm at El Gharag, where cotton was devastated by flea beetle during December.

Relevant meteorological data are shown overleaf.

RAINFALL, 1957-58 SEASON.

NUBA MOUNTAINS.

Station	*March*	*April*	*May*	*June*	*July*	*Aug.*	*Sept.*	*Oct.*	*Nov.*	*Total mm.*	*Average*
Kadugli	1·0	—	153·0	136·5	123.5	121·5	83·0	62·5	—	681	756
Dilling	—	—	19·0	102·0	200·0	226·0	188·0	16·0	—	751	679
Lagowa	—	—	36·0	96·5	98·0	180·5	84·5	80·5	—	576	698
Talodi	98·5	60·0	44·5	240·5	197·0	78·5	104·5	99·0	3·5	926	818
Kalogi	—	21·5	33·5	154·0	133·0	190·5	92·0	146·5	3·5	774·5	778
A/Gubeiha	—	8·0	104·0	143·0	227·0	274·0	37·0	40·0	—	833	710
U/Berembeita	—	—	38·0	115·0	124·0	194·0	51·0	38·0	—	560	650
Abbassiya	—	—	40·0	71·0	235·0	201·0	90·0	23·0	—	660	694
										714	723

TEMPERATURES °F.

KADUGLI.

	M. max.	*Range*	*M. min.*	*Range*
Period resting Dec. '56-May '57	98·0	104–94	69	71–68
Period growth June '57-Nov. '57	93·0	99–86	70	73–64

Variety Testing.

(*1*) *Kordofan.*

Comprehensive data for the Nuba Mountains trials are shown in Table 4. Yields generally were low and in the absence of any over-riding pest or disease the poor returns are difficult to explain. Though the Septemer rainfall was well below average, this could hardly have affected a crop already well established.

Although Wilds SUS 16/1 again headed the overall lint figures (226 lb. per acre), its superiority over the BAR 7/8 derivatives was not marked. Only at Kadugli did Wilds show a significant increase over the *mean* of the three BAR 7/8 strains. The relative positions of BAR 11/7, BAR 11/7.1 and Pump Scheme Strain are worthy of note. BAR 11/7 has consistently outyielded Pump Scheme although a significant increase has been attained only at the Dilling site. Elsewhere than Talodi, BAR 11/7.1 has failed to give the response expected of it, although it is premature to judge the results from a single season. Seed from BAR 11/7.1 Group I and Group II grown in panmixis plots during the present season will appear in all variety trials in 1958-59, thus giving a clearer picture of its yield potential vis-a-vis that of BAR 11/7.

Punjab 268F has shown an average response: this, however, is poor when compared with the very high yields obtained under irrigation north of the 12° parallel.

(*2*) *Tozi and Yambio.*

Table 5 has been compiled from plot data kindly supplied by the Senior Research Officers at Tozi (Central Rainlands) and Yambio (Equatoria).

At Tozi the first planting, on 2nd July, was drought-stricken and the whole trial was replanted on 29th July. Thrips damage on this cotton was severe and the crop was saved by DDT spraying. In the light of late planting and the incidence of pests final yields were poor, differing little from those of the Kordofan trials.

BAR 7/8.2 gave a significant increase over BAR SP84, Wilds, BAR 11/7 and Pump Scheme Strain while yields from BAR 11/7 and Pump Scheme were low and their relative positions disappointing. Wilds SUS 16/1 failed to maintain its position of superiority as shown in the Kordofan trials and much more information is required before this irrigated quality American can be considered as a possible replacement of the standard rainfed types. Yield figures from Punjab 268F were not up to expectations.

TABLE 4.

VARIETY TRIALS. NUBA MOUNTAINS, 1957-58.

Yield of seed cotton and lint in lb./acre.

Variety	*Dilling*			*Kadugli*			*Talodi*			*Lagowa*			*Abu Gubeiha*			*Overall Means*		
	S/c	*Lint*	*G.O.T.*	*S/c*	*Lint*	*G.O.T.*	*S/c*	*Lint*	*G.O.T.*	*S/c*	*Lint*	*G.O.T.*	*S/c*	*Lint*	*G.O.T*	*S/c*	*Lint*	*G.O.T.*
BAR 7/8.1	700	243	34·9	742	209	28·3	932	270	29·0	524	178	34·0	750	254	33·8	730	231	32·0
BAR 7/8.2	641	226	35·1	825	274	33·2	902	304	33·8	605	208	34·4	785	260	33·1	752	254	33·9
BAR 7/8.3	688	237	34·5	742	246	33·0	878	288	32·7	—	—	—	—	—	—	769	257	33·4
BAR SP84	534	180	33·9	671	218	32·6	760	246	32·5	400	138	34·6	687	228	33·1	610	202	33·3
BAR 11/7	712	233	32·7	795	223	28·1	861	256	29·7	524	157	30·0	766	217	28·4	732	217	29·8
BAR 11/7.1	629	201	31·9	772	223	28·8	890	266	29·8	—	—	—	—	—	—	764	230	30·2
PSS	641	192	29·9	730	214	29·4	878	250	28·5	508	147	29·0	766	216	28·2	705	204	29·0
Wilds SUS 16/1	813	257	31·6	926	282	30·4	1003	313	31·2	627	205	32·7	868	272	31·3	847	266	31·4
Punjab 268F	718	239	33·3	837	274	32·8	772	246	31·9	465	140	30·1	795	271	34·1	717	234	32·4
S.E. Mean	12·8			5·9			11·1			9·5			8·0					
L.S.D. (5% level)	36·3			16·6			31·2			27·3			22·9					
Planting date	6th July			18th July			17th July			17th July			13th July					
Picking date	9th Nov.-end Dec.			12th Nov.-end Dec.			11th Nov.-end Dec.			12th Nov.-end Dec.			12th Nov.-end Dec.					
Layout	9×9 Latin square			9×9 Latin square			9×9 Latin square			7×7 Latin square			7×7 Latin square					
Effective plot size (acres)	0·017			0·017			0·017			0·032			0·032					
Spacing	90×45 cm. at 3 p.p.h.			90×45 cm. at 3 p.p.h.			90×45 cm. at 3 p.p.h.			90×45 cm. at 3 p.p.h.			90×45 cm. at 3 p.p.h.					

TABLE 5.

VARIETY TRIALS, 1957-58.

Yield of seed cotton and lint in lb./acre.

	Tozi			*Yambio*					
				Road C			*East Road*		
	S/c	*G.O.T.*	*Lint*	*S/c*	*G.O.T.*	*Lint*	*S/c*	*G.O.T.*	*Lint*
BAR 7/8.1	678	33·4	227	702	40·8	286	474	40·2	191
BAR 7/8.2	762	33·9	258	1027	41·0	421	509	41·0	209
BAR SP84	558	34·9	194	850	37·9	322	472	37·0	175
BAR 11/7	461	30·0	138	1098	34·4	377	451	36·0	162
PSS	562	28·3	159	840	35·7	300	467	35·7	167
Punjab 268F	671	32·7	219	940	37·9	357	482	39·0	188
Wilds SUS 16/1	596	29·3	175	—	—	—	—	—	—
S.E. Mean			19·6			18·6			14·1
L.S.D. (5% level)			57			54			N.S.
	Planted: 29th July 1957 Picking: 14.10.57–12.12.57			Planted: Road C 7.6.57 Picking: 11.10.57-30.11.57			East Road 13.6.57 28.10.57-30.11.57		
	Randomized block: 6 replications Effective plot size = 0·022 acres Spacing: 28″×6″. 1 plant per hill			Randomized block: 6 replications Effective plot size = 0·025 acres Spacing: 90 × 45 cm. at 3 plants per hill					

The most striking feature of the Yambio trial (Road C) was the yield of seed cotton from BAR 11/7. Although its G.O.T. was relatively low, it still held second place to BAR 7/8.2 in lint returns.

The yields from the East Road were poor. Grown on 2nd year land, with poor germination and establishment, this trial has given little information.

Very high G.O.T.s are again recorded from the Yambio trials, a circumstance which has been noted over the last four years.

Cotton Propagation.

On the Abu Habl Scheme the main propagation area for BAR 7/8.1 (2938 feddans) averaged 4·9 small kantars of seed cotton (approx. 489 lb. per acre) while on the Semeiha Extension 543 feddans of BAR 11/7 gave 3·72 small kantars (approximately 372 lb. per acre). In the latter variety excellent grades were returned, 300 bales from a total of 336 being classified as 'Best Grade One Nuba'. In the coming season this seed from BAR 11/7 will plant the whole of the Abu Habl Scheme while the residue will replace S47 on the East Bank of the Nile (Equatoria).

Small panmixis plots ($\frac{1}{4}$ acre each) of BAR 11/7 Group I and II were grown in isolation at the Kamina Farm with a further area of BAR 11/7 Bulk (2 acres) at El Effein. Two further filters for quality improvements, BAR 7/8.4 and 5, were grown at Hager el Mek (1 acre) and El Effein (2 acres) respectively. The Department of Agriculture kindly undertook the propagation of BAR SP84 (2 acres) at the Main Farm, Kadugli.

Publications.

Cotton Breeding Section, Research Division.—'The Sudan and its Cotton'. Section for the Sudan Gezira Board Handbook.

Saunders, J. H.—'Variation within *Gossypium anomalum*': Heredity (in press).

Saunders, J. H. and Low, A.—'Busman's Holiday'. Empire Cotton Growing Review, Vol. xxxv, No. 2, April 1958.

Appendix.

Key to Symbols Used in this Report.

Egyptian S types.

DS	Domains Sakel originally imported from Egypt.
BAR 14/25	A Sakel type carrying B_2 and B_3 (formerly BLR).
BAR 14/25.4 and 5	4th and 5th filter for yield (formerly BLR).
BAR 14/48	The first Sakel type to carry $B_2B_3B_6$ (formerly BLR).
BAR 14/49	Successor type to BAR 14/48.

Egyptian L types.

X1730A or XA	Successor type to X1730.
BAR XL1 BAR 1730L1	1st filter of BAR 1730L carrying B_2.
BAR 4/16	An X1730A type carrying B_2 and B_3.
BAR 5/6	As BAR 4/16 but carrying the red *arboreum* gene R_2^{RS}.
BAR 4/24	An X1730A type carrying $B_2B_3B_6$.
BAR 4/25	An X1730A type carrying $B_2B_3B_6$.
BAR 5/7	As BAR 4/25 but carrying in addition the red *arboreum* gene R_2^{RS}.
BAJ lines	The hairy Sakel series, homozygous for B_2 and B_3 and carrying H_1.
BAN lines	A Sakel series stemming from the cross BAR 14/25 × *G. auritum*: ovule transfer for yield increase.

American Upland.

BAR SP84	The blackarm resistant component of Uganda SP84.
BAR 7/8.2 BAR 7/8.1	BAR SP84 carrying B_2 and B_3, 1st and 2nd filters.
Pump Scheme Strain (PSS)	An old commercial bulk deriving from Nyasaland Upland.
BAR 11/5	XA129 (PSS) carrying B_2.
BAR 11/7	XA129 carrying B_2 and B_3.
BAR 11/7.1	1st filter of BAR 11/7.
Wilds SUS 16/1	American long staple type: irrigated.
P268F	American importation direct from India.
Hopi Acala	A very early type directly imported from U.S.A. 1953: of high intrinsic fibre strength.
Acala 4.42	A high quality American importation, 1955.

Genes.

B_1	A weak dominant blackarm resistance factor from Uganda B31.
B_2	A strong dominant blackarm resistance factor from B31.
B_3	A partially dominant blackarm resistance factor from *G. punctatum*.
B_4	A partially dominant blackarm resistance factor from *G. arboreum*.
B_5	A partially dominant blackarm resistance gene from 'Grenadines White Pollen'.
B_6	A blackarm resistance intensifier from *G. arboreum*.
B_7	A partially dominant blackarm resistance gene from Stoneville 20.
b_8	A recessive blackarm resistance gene from *G. anomalum*.
H_1	A hairiness gene from Tanguis.
H_2	A hairiness gene from *G. tomentosum*.

Sudan Measures and Weights.

1 feddan = 1·038 acres.
1 large kantar = 315 rotls.
1 small kantar = 100 rotls.
1 rotl = 0·99 lb.

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PROGRESS REPORTS FROM EXPERIMENT STATIONS

The reports for the seasons up to and including 1950-51 were published in seasonal volumes; the following are still in print and available at 3/- per volume post free.

1923-25 (one volume), 1926-1927, 1931-32, 1934-35, 1935-36, 1942-43 and 1945-46 to 1950-51.

From 1951-52 the reports from each territory were published individually each season. A few of the 1951-52 reports are out of print, but all others are available post free at 1/- per report or 7/6d. for the seasonal set.